

## PATENT ABSTRACTS OF JAPAN

(11)Publication number : 2000-243787

(43)Date of publication of application : 08.09.2000

(51)Int.Cl.

H01L 21/60

(21)Application number : 11-039396

(71)Applicant : HITACHI CABLE LTD

(22)Date of filing : 18.02.1999

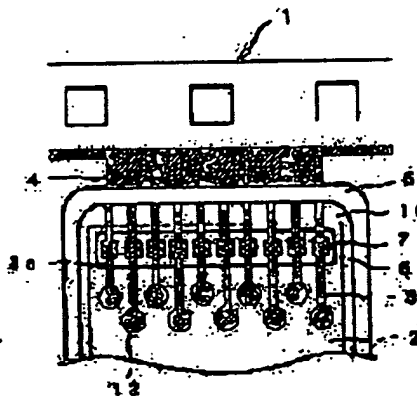
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## (54) TAB TAPE AND BGA SEMICONDUCTOR DEVICE USING THE SAME

## (57)Abstract:

**PROBLEM TO BE SOLVED:** To prevent short circuit caused by uncertain disconnection of a lead by a method, wherein wiring leads are disconnected from a feed line by a slit 5, and the inner leads are electrically separated from each other.

**SOLUTION:** Wiring leads 3 and a feed line 4 are disconnected from each other by a slit 5, which is provided crossing the wiring leads 3 after a wiring pattern is plated with Au in a TAB tape manufacturing process. In other words, the outline of a semiconductor device formed by the slit 5, which disconnects the wiring leads 3 from the feed line 4 after electroplating is so determined as to be located between the wiring leads 3 and the feed line 4, and the inner leads 3a are electrically separated from each other by the slit 5. That is, the wiring pattern 3 is arranged on the surface region of the tape base 10, so that the feed line 4 does not exist on a region where a semiconductor chip 2 is mounted.



## LEGAL STATUS

[Date of request for examination] 16.11.2001

[Date of sending the examiner's decision of rejection]

[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]

[Date of final disposal for application]

[Patent number] 3482900

[Date of registration] 17.10.2003

[Number of appeal against examiner's decision of rejection]

[Date of requesting appeal against examiner's decision of rejection]

[Date of extinction of right]

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**CLAIMS**


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[Claim(s)]

[Claim 1] The wiring lead according to individual containing two or more inner leads electrically connected to the terminal electrode of a semiconductor chip on a tape base material, It is the TAB tape on which common electric supply Rhine for giving electroplating to these wiring lead was prepared. In the TAB tape constituted so that the aperture for bondings which prepared said two or more inner leads in the tape base material might be built and an inner lead might be connected to the terminal electrode of a semiconductor chip into the aperture for bondings After electroplating, a slit is prepared in the form which intersects said two or more wiring leads between said aperture for bondings, and said common electric supply Rhine. The TAB tape characterized by making said two or more inner leads become independent electrically, respectively while separating electric supply Rhine from a wiring lead by this slit.

[Claim 2] The TAB tape according to claim 1 characterized by being prepared so that said slit may form appearance Rhine of a semiconductor device.

[Claim 3] The wiring lead according to individual containing two or more inner leads electrically connected to the terminal electrode of a semiconductor chip on a tape base material, It is a BGA mold semiconductor device using the TAB tape on which common electric supply Rhine for giving electroplating to these wiring lead was prepared. A semiconductor chip is prepared in the field by the side of the wiring lead of said TAB tape through an elastomer. The aperture for bondings is formed in the tape base material of a part with which said two or more inner leads exist. In the BGA mold semiconductor device which connected to the terminal electrode of a semiconductor chip the inner lead which exists in the form over which this aperture for bondings was built After electroplating, a slit is prepared in the form which intersects said two or more wiring leads between said aperture for bondings, and said common electric supply Rhine. The BGA mold semiconductor device characterized by connecting with the terminal electrode of a semiconductor chip, without cutting the inner lead over which said two or more inner leads were made to become independent electrically, respectively, and said aperture for bondings was built while separating electric supply Rhine from the wiring lead by this slit.

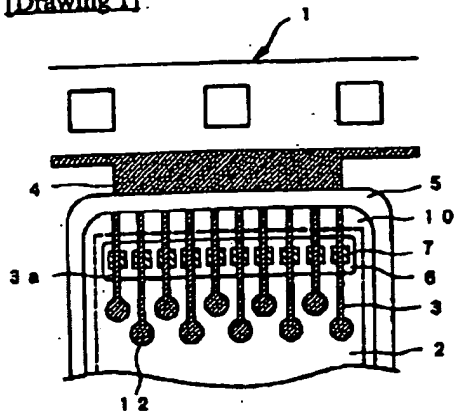
[Claim 4] The BGA mold semiconductor device according to claim 3 characterized by said slit forming appearance Rhine of a semiconductor device.

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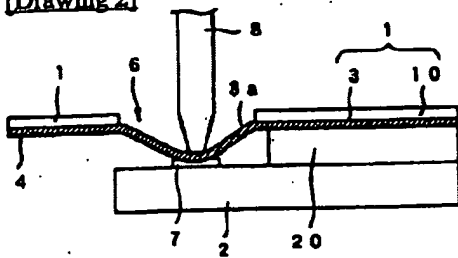
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# DRAWINGS

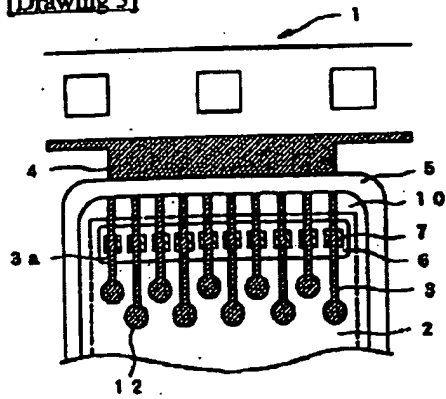
[Drawing 1]



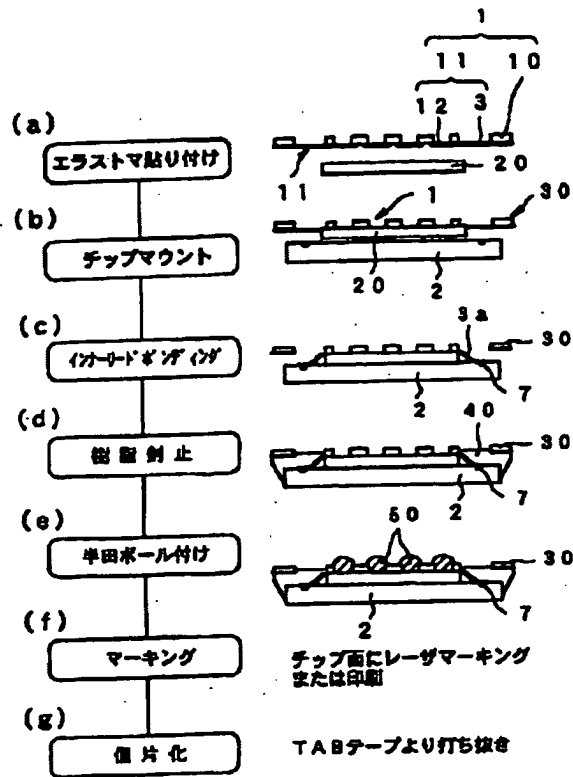
[Drawing 2]



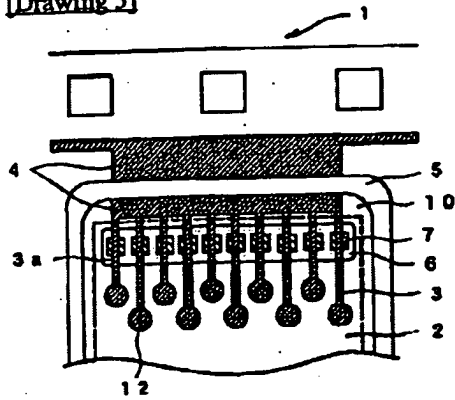
[Drawing 3]



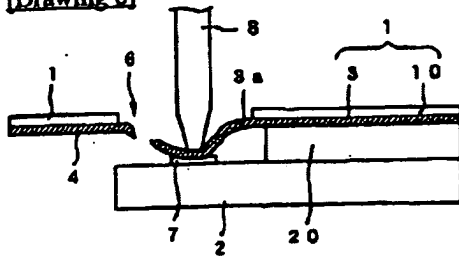
[Drawing 4]



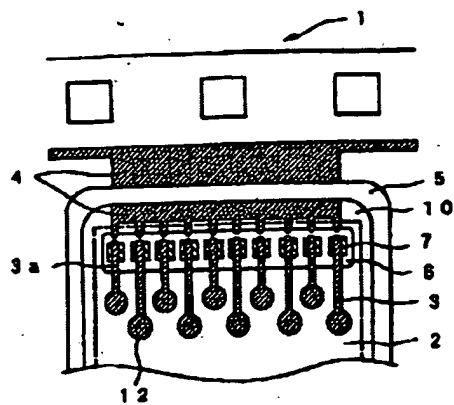
[Drawing 5]



[Drawing 6]



[Drawing 7]



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## DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the BGA mold semiconductor device which used a TAB (Tape Automated Bonding) tape and this.

[0002]

[Description of the Prior Art] There is a semiconductor device of the BGA (Ball Grid Array) package which performs a surface mount to a printed circuit board using a solder ball. the description of this BGA mold semiconductor device be the point that many pin(many items child)-ization can be attain, without narrow the pitch between terminals (lead) as compared with what be connect like QFP (Quad Flat Package) using an outer lead in each side of a package, since the electric junction to a printed circuit board be attain all over the flat surface section of a package. It is that it is suitable for thin-shape-izing and a miniaturization, and CSP (Chip Size Package), such as muBGA (U.S. TESERA trademark), becomes possible about what used especially the TAB tape as structure material of a package.

[0003] muBGA package is tape BGA type CSP, and it has further the structure connected with the lead formed at S characters between a chip and a TAB tape through an elastomer (low elastic resin) between a chip and a TAB tape. With this muBGA technique, since the elastomer is made to intervene between a chip and a TAB tape, the thermal stress produced between a package and a printed circuit board can be eased, and the life of a solder ball joint can be raised.

[0004] The assembly process which uses a TAB tape for drawing 4 and manufactures the semiconductor device of muBGA structure is shown.

[0005] An elastomer 20 is stuck on the TAB tape 1 which formed the circuit pattern 11 which contains the wiring lead 3 and a land 12 in one side of the tape base material 10 which consists of an insulating film, and the TAB tape 30 for BGA with an elastomer is formed in it ( drawing 4 (a)).

[0006] A semiconductor chip 2 is mounted on this TAB tape 30 for BGA with an elastomer ( drawing 4 (b) ). A semiconductor chip 2 is pasted up on the TAB tape 30 through the double-sided adhesive film slack elastomer 20.

[0007] Subsequently, inner lead 3a of the TAB tape 30 for BGA with an elastomer is formed in S characters with a bonding tool, and it connects with the terminal electrode slack electrode pad 7 of a semiconductor chip 2 ( drawing 4 (c) ). That is, the bonding tool 8 ( drawing 6 ) cuts the notch of inner lead 3a, forms inner lead 3a in the shape of S character further, and carries out bonding with heat and a supersonic wave on the electrode pad 7 of a semiconductor chip 2.

[0008] Subsequently, the electrode pad 7 of the joined semiconductor chip 2 and lead 3a are closed with closure resin 40 ( drawing 4 (d) ).

[0009] and the solder ball 50 – the part of the land 12 of the TAB tape 1 – carrying ( drawing 4 (e) ) – a chip side – laser marking – or it prints ( drawing 4 (f) ). Finally, by piercing from the TAB tape 30 for BGA with an elastomer, it piece[ of an individual ]-izes and considers as muBGA package.

[0010] thus, with muBGA package using a TAB tape As one means for attaining a thin shape and a miniaturization, not using the wirebonding method general to the electrical installation of the wiring lead 3 of a TAB tape, and the electrode pad 7 of a semiconductor chip 2, as shown in drawing 5 The aperture 6 for bondings (bonding window) is formed in the part of the TAB tape located in right above [ of the electrode pad 7 of a semiconductor chip 2 ]. This part was built through inner lead 3a of the wiring lead 3, the bonding tool 8 cut one side of the wiring lead 3 like drawing 6 , and the approach (inner lead bonding) of striking this against the electrode pad 7 of a semiconductor chip 2 directly is taken.

[0011]

[Problem(s) to be Solved by the Invention] By the way, the wiring lead of a TAB tape electroplates Au for the above-mentioned connection method, although Cu foil is generally used. In order to perform this plating, as shown in drawing 5 , in the production process of a TAB tape, each wiring lead 3 connected with the electrode pad 7 of a semiconductor chip is in the condition of having been connected by electric supply Rhine 4.

[0012] Furthermore, in case it is connection (inner lead bonding) between a terminal electrode and a

wiring lead since electric supply Rhine exists in a package in the conventional technique even after separating this package from a TAB tape, if one side (electric supply line side) of a wiring lead is not cut certainly, it will short-circuit by terminal inter-electrode.

[0013] In order to cut certainly one side (electric supply line side) of a wiring lead, in an inner-lead-bonding process, it is necessary to fix the tape part of a package edge with a fixture. However, it is in the inclination to bring package size (tape size) close to a chip size infinite, and, for this reason, the fixed cost of a tape decreases, cutting of the lead at the time of bonding may be becoming difficult, contact (short) of the once cut inner lead may occur, and positive fixed \*\*\*\*\* may become a fatal problem on the function of a product.

[0014] The purpose of this invention is to offer the BGA mold semiconductor device using the TAB tape and this to which the fault of the above mentioned conventional technique is canceled, and do not have the need of cutting a wiring lead from an electric supply line side in an inner-lead-bonding process, therefore short generating based on cutting of an uncertain lead at an inner-lead-bonding process cannot take place theoretically on package manufacture and which have high dependability.

[0015] [Means for Solving the Problem] In order to attain the above-mentioned purpose, the TAB tape of this invention The wiring lead according to individual containing two or more inner leads electrically connected to the terminal electrode of a semiconductor chip on a tape base material, It is the TAB tape on which common electric supply Rhine for giving electroplating to these wiring lead was prepared. In the TAB tape constituted so that the aperture for bondings which prepared said two or more inner leads in the tape base material might be built and an inner lead might be connected to the terminal electrode of a semiconductor chip into the aperture for bondings After electroplating, a slit is prepared in the form which intersects said two or more wiring leads between said aperture for bondings, and said common electric supply Rhine. While separating electric supply Rhine from a wiring lead by this slit, said two or more inner leads are made to become independent electrically, respectively (claim 1).

[0016] Moreover, the wiring lead according to individual containing two or more inner leads by which the BGA mold semiconductor device of this invention is electrically connected to the terminal electrode of a semiconductor chip on a tape base material, It is a BGA mold semiconductor device using the TAB tape on which common electric supply Rhine for giving electroplating to these wiring lead was prepared. A semiconductor chip is prepared in the field by the side of the wiring lead of said TAB tape through an elastomer. The aperture for bondings is formed in the tape base material of a part with which said two or more inner leads exist. In the BGA mold semiconductor device which connected to the terminal electrode of a semiconductor chip the inner lead which exists in the form over which this aperture for bondings was built After electroplating, a slit is prepared in the form which intersects said two or more wiring leads between said aperture for bondings, and said common electric supply Rhine. While separating electric supply Rhine from a wiring lead by this slit, said two or more inner leads are made to become independent electrically, respectively, and it connects with the terminal electrode of a semiconductor chip, without cutting the inner lead over which said aperture for bondings was built (claim 3).

[0017] The main point of this invention has the slit formed in order to separate electric supply Rhine from a wiring lead after electroplating in having determined that it came on the wiring lead between a wiring lead and electric supply Rhine, and having made said two or more inner leads become independent, respectively. By this, in the case of connection between the terminal electrode of a semiconductor chip, and a wiring lead, the need of cutting a wiring lead from an electric supply line side is lost, and short generating of the lead on package manufacture can be abolished theoretically.

[0018] In the TAB tape or BGA mold semiconductor device of this invention, it is good to prepare so that said slit may form appearance Rhine of a semiconductor device (claims 2 and 4). The description of this gestalt is to have arranged the location of electric supply Rhine for performing Au plating to the wiring lead of a TAB tape on the outside of a package, and it is to the point which can abolish in the need that this cuts a wiring lead from an electric supply line side in the case of connection between the terminal electrode of a semiconductor chip, and a wiring lead, and can be theoretically abolished in short generating on package manufacture.

[0019]

[Embodiment of the Invention] Hereafter, this invention is explained based on the operation gestalt of illustration.

[0020] Drawing 1 is the plan having shown the condition of having used the elastomer 20 and having carried the semiconductor chip 2 like drawing 4 (a) on the TAB tape 1 concerning 1 operation gestalt of this invention, and in order to make an understanding easy, it expresses the wiring lead 3 and electric supply Rhine 4 with the maximum front face.

[0021] The TAB tape 1 is formed on the tape base material 10 which consists of an insulating film, and this tape base material 10, is prepared on the tape base material 10 as well as the wiring lead 3 according to individual containing two or more inner lead 3a electrically connected with the terminal electrode slack electrode pad 7 of a semiconductor chip 2, and has common electric supply Rhine 4 for giving electroplating to the above-mentioned wiring lead 3. Moreover, the TAB tape 1 has the aperture 6 for bondings formed in the tape base material 10 in the part in which two or more above-mentioned inner lead 3a exists.

[0022] As mentioned above, as a result of forming the aperture 6 for bondings in the tape base material 10 in the part in which two or more above-mentioned inner lead 3a exists, this aperture 6 for bondings is built over two or more above-mentioned inner lead 3a, and it exists in the TAB tape 1. Two or more of such inner lead 3a has extended by the same width of face, and the notch which serves as a cutting location in the middle of inner lead 3a like before is not prepared.

[0023] In this drawing 1, the wiring lead 3 and electric supply Rhine 4 are divided by the slit 5 prepared in the form which intersects these wiring leads 3 after Au plating termination of a circuit pattern 11 in the production process of a TAB tape. If it puts in another way, appearance Rhine of the semiconductor device formed after electroplating of the slit 5 which separates electric supply Rhine 4 from the wiring lead 3 is appointed at coming on the wiring lead 3 between the wiring lead 3 and electric supply Rhine 4, and it dissociates so that two or more inner lead 3a may become an independent existence electrically by the slit 5, respectively. That is, the circuit pattern 3 is arranged so that electric supply Rhine 4 may not exist in the field side (package inside surrounded in appearance Rhine of a semiconductor device) in which a semiconductor chip 2 is carried among the surface fields of the tape base material 10 in the TAB tape 1.

[0024] Drawing 2 is a cross section for a bonding area in an inner-lead-bonding process, and shows the condition that the bonding tool 8 got down to electrode pad 7 part exactly, and bonding was completed. Inner lead 3a over which the above-mentioned aperture 6 for bondings was built is stuck by pressure and connected to the terminal electrode slack electrode pad 7 of a semiconductor chip by the bonding tool 8 as shown in drawing 2. Although inner lead 3a is cut by the former at this time, inner lead 3a is stuck to the electrode pad 7 by pressure in this invention, without being cut.

[0025] That is, in the former, as shown in drawing 5, electric supply Rhine 4 exists in the surface field of the tape base material 10 of the TAB tape 1 in the semiconductor chip 2 loading-side, i.e., the inside of a semiconductor package. Consequently, since electric supply Rhine 4 will exist in a semiconductor package when the bonding tool 8 gets down to the part of the electrode pad 7 exactly like drawing 6 in the former and bonding is completed, if the wiring lead 3 is not certainly cut by the electric supply Rhine 4 side at the time of bonding, as an electric short next door and a product, it will become a defect completely. Therefore, in order to decide the location to cut from it being necessary to carry out the cutting, it is necessary to attach a notch to a lead. In order to prepare this notch in a lead, it is necessary to make large width of face of the lead which becomes origin, and it will become hindrance when advancing  $\infty$  pitch-ization. Moreover, in the former, in order to cut certainly one side (electric supply Rhine 4 side) of the wiring lead 3 in an inner-lead-bonding process, it is necessary to secure the fixed cost of a tape that the tape part of a package edge should be fixed with a fixture, and becomes a failure when making package size small.

[0026] However, in this operation gestalt, electric supply Rhine 4 did not exist in the package from drawing 1, but since the wiring lead 3 had been independent electrically respectively, the need of each wiring lead 3 of cutting by the electric supply Rhine 4 side (package outside) was lost that what is necessary is to just only be joined to the electrode pad 7 in the inner-lead-bonding process of drawing 2. Moreover, since the need of attaching a notch to each wiring lead 3 for cutting was lost,  $\infty$  pitch-ization of a lead was attained.

[0027] Moreover, according to the manufacture approach already stated by drawing 4 (a) - (g), an



elastomer 20 is used for drawing 3, it carries a semiconductor chip 2 in the TAB tape 1, a slit 5 cuts each wiring lead 3 and electric supply Rhine 4 further, and the semiconductor device of the BGA structure in the condition of having made the inner-lead-bonding process electrically joined to the electrode pad 7 of the semiconductor chip 2 which is visible to through a window [ of the aperture 6 for bondings ] completing is shown. Even if its fixed cost of a tape decreases on the TAB tape 1 since it does not need to be cut in an inner-lead-bonding process, and inner lead 3a attained miniaturizations, such as CSP, the danger that inner lead 3a will contact does not exist in essence.

[0028]

[Effect of the Invention] As explained above, according to this invention, the following outstanding effectiveness is acquired.

[0029] In the BGA mold semiconductor device which was constituted using a TAB tape or this according to invention according to claim 1 or 3 Since it determined that the slit formed in order to separate electric supply Rhine from a wiring lead after electroplating came on the wiring lead between a wiring lead and electric supply Rhine and said two or more inner leads were made to become independent, respectively In the case of connection between the terminal electrode of a semiconductor chip, and a wiring lead, the need of cutting a wiring lead from an electric supply line side is lost, and short generating of the lead on package manufacture can be abolished theoretically.

[0030] Moreover, since said slit formed appearance Rhine of a semiconductor device in the semiconductor device of the BGA mold constituted using a TAB tape or this according to invention according to claim 2 or 4, common electric supply Rhine for performing Au plating to a wiring lead does not remain by the TAB tape production process in a semiconductor device. Therefore, since a wiring lead will become independent electrically, it can lose theoretically short [ by poor cutting (uncutting) of the lead at the time of the bonding which it becomes unnecessary to have cut the wiring lead at the time of inner lead bonding, and had become a problem with the conventional technique / poor ].

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